

(1-5) Restriction Requirement

Applicants hereby affirm the election of the Group I Claims, Claims 1-49, for prosecution

(6) 37 CFR 1.75(c) Objection for Improper Form

Claims 5, 18 and 19 are objected to under 37 CFR 1.75(c) as allegedly being in improper dependent form.

Claim 5 is objected to for allegedly failing to further limit Claim 1. The Examiner objects to the phrase in the claim "the -NCO/-OH ratio is between 1 and 2." Claim 5 as presently amended no longer contains the phrase objected to by the Examiner.

Based on the foregoing, Applicants contend that Claim 5 is now in proper form and kindly ask that the objection be withdrawn.

Claims 18 and 19 are objected to for allegedly failing to further limit Claim 1. The Examiner points out that Claims 18 and 19 are directed to polycaprolactone diols yet Claim 18 depends from Claim 17, which is not directed to polycaprolactone diols. Claim 18 has been amended to depend from Claim 16 and Claim 19 amended to read "polycaprolactone diol". The amendments obviate the Examiner's objection, therefore, Applicants kindly ask that the objection be withdrawn.

(6) 35 U.S.C. Section 112, 2nd Paragraph

Claims 3, 6 and 26 have been rejected under 35 U.S.C. 112, second paragraph, for allegedly failing to point out and distinctly claim the subject matter which Applicants regard as the invention.

With reference to Claim 3, the Examiner states that it is not clear how the resin could have the same value for the nitrogen content derived from the unreacted NCO groups as the NCO content of the prepolymer. However, it appears that Claim 3 has been mis-understood or mis-read by the Examiner. The nitrogen content of the unreacted -NCO groups is wholly independent of the nitrogen content of the prepolymer. However, the values could be the same, for example, where each represents 50% of the total nitrogen available. The language recited in Claim 3 "derived from the unreacted -NCO groups of the diisocyanate component" simply establishes an antecedent basis for the claim element "nitrogen content" since -NCO and not nitrogen is specifically mentioned in Claim 1.

With respect to Claim 6, the Examiner states that the claim is vague since it is not clear whether Applicants are referring to the number average molecular weight or weight average molecular weight. Claim 6 has been amended to specify a weight average molecular weight and therefore is no longer vague.

Finally, Claim 26 has been rejected as the Office opines that the values for R_2 and R_4 are reversed. Claim 26 as amended, clarifies that R_2 contains from about 30 to about 80 equivalent % of R_4 .

Accordingly, Applicants kindly ask that the rejections to Claims 3, 6 and 26 be withdrawn.

The Invention

The invention is directed to a solvent soluble poly(urethane/urea) resin derived by reacting a polyurethane prepolymer and diamine. The polyurethane prepolymer being

the reaction product of (a) a diisocyanate component and a diol component which consist of (i) a first diol having a molecular weight below 2000 and (ii) a polymeric diol having a molecular weight below 3000; wherein the -NCO/-OH ratio is less than 2 and containing 1.3 to 6.0 wt. % of unreacted -NCO groups. The amount of diamine reacted with the prepolymer is 80% to 120% based on the equivalents of unreacted -NCO groups of the prepolymer.

(8) 35 U.S.C. Section 102

Claims 1-6, 8-10, 13, 15, 20, 21, 24-30 and 36-41 have been rejected as being anticipated by Yamashita (JP 4-209674).

Although Yamashita discloses a polyurethane resin, Yamashita does not anticipate Applicants' resin. A key aspect of Applicants' resin is that a solvent soluble poly(polyurethane/urea) resin is made by reacting a polyurethane prepolymer with diamine wherein the diamine is 80 to 120 % based on equivalents of unreacted -NCO groups and the polyurethane prepolymer is added at a controlled rate to the diamine. Yamashita does not describe adding his polyurethane prepolymer at a controlled rate to the diamine. For example, in each of Yamashita's examples, i.e. Examples 1 to 3, set forth in Yamashita on pages 18-21, the diamine is added to the urethane prepolymer solution.

Conversely, Applicants' invention requires that the polyurethane prepolymer be added to the diamine and at a controlled rate. The order and rate of addition is critical if gelling of the poly(urethane/urea) resin is to be avoided. The surprising benefit of Applicants' resin, as derived by Applicants' synthesis technique, is set forth on page 11, lines 7 and 8 of Applicants' specification where it

indicates that controlling the rate of addition of the polyurethane prepolymer solution to the diamine eliminates or substantially restricts forming an extremely viscous and unworkable poly(urethane/urea) resin. Accordingly, it is submitted that Yamashita's poly(urethane/urea) resin of represents a different resin than that of Applicants'. Yamashita's resin would unavoidably exhibit different physical properties than Applicants' resin since the resin synthesis set forth in Yamashita would produce a gel or an extremely viscous resin.

In sum, Yamashita fails to disclose the aforementioned novel aspects of Applicants' resin. Therefore, Applicants kindly ask that the rejection be withdrawn.

(14) 35 U.S.C. Section 102

Claims 1, 5, 6, 8-10, 15, 20, 21, 24, 28-30 and 36-38 have been rejected as being anticipated by Mauro et al. (6,245,695).

Although Mauro et al. disclose a polyurethane based resin, they do not disclose a resin that anticipates Applicants' invention.

The Examiner cites Example I-2 of Col. 9 of the Mauro et al. in rejecting Applicants' claims. However, the example fails to disclose a polyurethane resin having a polyurethane prepolymer derived from reacting a diisocyanate component and a diol component made of a first diol of molecular weight below 2000 and a polymeric diol of molecular weight below 3000. The polyurethane prepolymer of Mauro et al. is formed by reacting a diisocyanate component and a polyester polyol component wherein the polyol is formed by reacting a polyol and a dicarboxylic acid (see

Col. 5, lines 5 and 6). Accordingly, the polyols described and used in Mauro et al. would by definition contain three or more hydroxyl groups whereas Applicants' diol component must contain only two hydroxyl groups.

In summary, Mauro et al. fail to disclose the aforementioned essential aspect of Applicants' resin. Therefore, Applicants kindly ask that the rejection be withdrawn.

(9-13) 35 U.S.C. Section 103

Claims 7, 11, 12, 14, 16-19, 22, 23, 31-35 and 42-49 are rejected as being obvious over Yamashita.

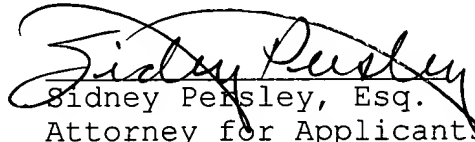
The Examiner cites additional portions of Yamashita (example 1, pages 7, 9, 11, 14, 15 and 31) to show that it would have been obvious to vary the composition of example 1 to form Applicants' resin in a laminate using a mixture of diisocyanates, polycaprolactone diols, butanediol, an acetate solvent, and a nitrocellulose dispersant.

As stated above, however, Applicants have discovered that adding the polyurethane prepolymer to the diamine at a controlled rate is critical to eliminate or to substantially avoid resin gelling. Nowhere in Yamashita is there a teaching that would lead one skilled in the art to deliberately add the urethane prepolymer (formed from a diisocyanate component) and a first and second diol component to the diamine.

Therefore, the teachings of Yamashita, even if adopted by one of ordinary skill in the art, would not render Applicants' solvent soluble poly(urethane/urea) resin obvious. Applicants kindly ask that the rejection be withdrawn.

Applicants believe that the amendments and remarks made herein, adequately and completely address the rejections raised by the Examiner. Therefore, Applicants respectfully request allowance and issuance of Claims 1-49.

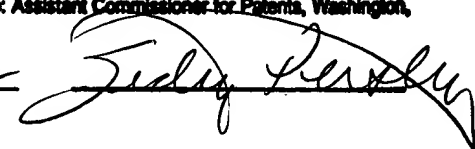
Respectfully submitted,


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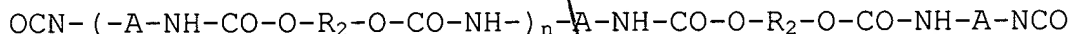
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APPENDIX II
VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the specification:

On Page 7, the first full paragraph has been amended as follows:

The polyurethane prepolymer is a condensation reaction product of a diisocyanate component and a diol component in which the -NCO/-OH ratio is less than 2. As used herein the "-NCO/-OH ratio" is intended to mean the ratio of equivalents of -NCO groups in the diisocyanate component, to equivalents of -OH in the diol component. The -NCO/-OH ratio is sometimes identified as the isocyanate index (I.I.). Preferably the -NCO/-OH ratio is between about 1 and 2, and more preferably 1.5. The polyurethane prepolymer has the structure:



wherein -A- is an aryl or alkyl group; and R₂ is R₃ and R₄; wherein R₃ is an alkyl or a polymeric group having a molecular weight below 2000; wherein R₄ is a polymeric group having a molecular weight below 3000. As indicated above, the polyurethane prepolymer contains 1.3 to 6 % by weight of unreacted -NCO groups which are represented in this polyurethane structure. In particular, the nitrogen content of the solvent-soluble poly(urethane/urea) resin [, derived from these unreacted -NCO groups] of the [diisocyanate] present invention is from 1.3 to 6.0 % by weight. Typically, the molecular weight of R₃ is less than the molecular weight of R₄, and the molar ratio of R₄ to R₃ ranges between about 90:10 and about 10:90; and preferably,

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R₂ contains from about 30 to about 80 equivalent % of R₄, and the ratio of R₄ to R₃ is about 55:45.

On Page 27, the first full paragraph has been amended as follows:

In these formulations the red, blue and yellow pigments were the same as those in Examples 10, 11, and 12 respectively; and the conventional resin is Mitchanol's Surkofilm 71H. These ink formulations were prepared as described in connection with Examples 10, 11, and 12. While the comparative ink formulations A, B and C, could be printed using a gravure printing press, they [the] could not be used in flexographic printing because of poor alcohol solubility.

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